Department: **Computers and Control Engineering**
Total Marks: 90 Marks

Faculty of Engineering

Course Title: **Database Systems**
Date: **12.01.2015** (Final Exam)

Course Code: **CCE3112 - 3rd** year Students
Allowed time: 3 hours

Answer the following three questions:

Question 1: (30 marks)

1. With the aid of the **three-schema** structure, explain the concepts of **logical** and **physical** independence?

2. **Write** the equivelant **relational calculus** expressions for each of the following **relational algebra:**

   a. $\pi_{\text{Number, Name, Age}}(\sigma_{\text{Salary} > 40}(\text{EMPLOYEES}))$

   b. $\pi_{\text{NameH, SalaryH}}(\rho_{\text{NumberH, NameH, AgeH, SalaryH} \leftarrow \text{Number, Name, Age, Salary}}(\text{EMPLOYEES}) \bowtie_{\text{NumberH=Head}} (\text{SUPERVISION} \bowtie_{\text{Employee} = \text{Number}} (\sigma_{\text{Salary} > 40}(\text{EMPLOYEES}))))$

3. Discuss the meaning of the following **SQL query**:

```
SELECT    employee_id, last_name, job_id, &column_name
FROM      Employees
WHERE     &condition
ORDER BY &order_column ;
```

4. **Given the following schema:**

   EMPLOYEES (RegNo, FirstName, Surname, Dept, Salary, City)

   DEPARTMENT (DeptName, Address, City)

Write the SQL query statement for:

a) Write a query that will display **the difference** between **the highest and lowest salaries** in each department.

b) Display the employee **number, name and salary for** all employee **who earn more than the average salary.**

Question 2: (30 marks)

1. A database management system (**DBMS**) is a software system able to manage collections of data that are: ***large***, ***shared***, and ***persistent***, and to ensure their ***reliability***, and ***privacy***. It also must be ***efficient*** and ***effective***. Explain this assertion

2. **Given the following schema:**

   Salesman(Number, Name, Branch, Salary, Commission)

Write the SQL query statement for:

a. Display the **name**, **salary** and **commission** for all **salesmen** who **earn commissions**, Sort data in **descending order of salary and commissions**?

b. Find which **branches** spend more than **100** on salaries?

c. Display the **name** and **salary** for all **salesmen** whose name begin with letter **'M'** and their salary is not in the range of **45** and **65**.

3. Consider the **two relations** given below. Find the **SQL query** and the **outputs** for each of the following:

a) **Find the drivers with their cars including the drivers without cars?**
b) **Find the cars with their drivers including the cars without drivers?**
c) **Find all the drivers with all the cars?**

DRIVERS

DriverID	FirstName	Surname
VR1000Y	Mostafa	Fahmy
PZ1000B	Samir	Mahmoud
AP1000R	AbdAllah	Arafat

AUTOMOBILE

CarRegNo	Make	Model	DriverID
ABC123	BMW	323	VR1000Y
DEF456	BMW	Z3	VR1000Y
GHI789	TOYOTA	Yaris	PZ1000B
BBB421	BMW	316	MI1000U

Question 3: (30 marks)

1. **Create the STUDENT table based on the following table instance chart. Confirm that the table is created.**

COLUMN NAME	ID	NAME	AGE
Default value	1	Not available	20
DATATYPE	Number	Varchar2	Number
LENGTH	7	25	2
CONSTRAINT	not repeated, not empty	repeated	repeated, check it is a positive

a) Fill the **STUDENT** table with **4 tuples** containing any data you need.
b) Add column **Address** to table **STUDENT.**
c) Move the table **STUDENT** to the **recycle bin.**

2. What is the ***difference*** between:
   a. **WHERE** and **HAVING** clauses.
   b. **Degree** and **cardinality** of a relation.
   c. **Logical** models and **conceptual** models.

3. With reference to the following database schema:

CITIES(Name, Region, Population)
CROSSING (City, River)
RIVERS (River, Length)

Formulate the following queries in both **Relational Algebra and SQL statements**:

1. Find the **names, regions** and **population** for the cities that have more than **50 thousand in habitants and** are crossed by the **Thames or the Mersey**

2. Find the **cities** that are crossed by **(at least) two rivers**, giving the name of the **city** and the **length** of the rivers.

With my best wishes,
Dr. Dina M. Ibrahim